STORMWATER REPORT

For

Bright Stars Daycare
355 E. Sunset Way
Issaquah, WA 98027

December 17, 2021

12/17/2021

Prepared by:
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Encompass Engineering Job No. 21695

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I. PROJECT OVERVIEW

Project:	Bright Stars Daycare
Site Address:	355 E. Sunset Way, Issaquah, WA 98027
King County Tax Parcel:	342406-9096
Site Area:	13,200 SF (0.30 AC)
Zoning District:	MF-H (Multifamily-High)

Figure 1: Vicinity Map

The proposed project is located on the south side of E. Sunset Way in the City of Issaquah. The 13,200 SF (0.30 AC) parcel is currently developed with a single-family residence. The site is mostly flat with 2-3% slopes in the southwest direction. The site is bordered to the north by E. Sunset Way, to the west by a small apartment building, and to the east and south by single-family residential lots. This project proposes to construct a new commercial daycare facility in the northern portion of the site, with parking access from a public alleyway on the south side of the property. Stormwater from the site will be collected and conveyed to an on-site underground infiltration bed.

II. CONDITIONS SUMMARY AND SITE ANALYSIS

Existing Conditions:
The project is located in the City of Issaquah on a 13,200 SF (0.30 AC) parcel that is zoned as Multifamily-High (MF-H). The site currently contains a 1,199 SF (roof area) single-family residence, a 97 SF (roof area) shed, and 903 SF of uncovered walkways. The site is bordered to the north by E. Sunset Way, to the west by a small apartment building, and to the south and east by single-family residential lots. The site does not have any critical areas associated with it; however, the site is located within a Category 1 Critical Aquifer Recharge Area (CARA).

The soils on site have been classified by the United States Geological Survey (USGS) Web Soils Survey as Everett very gravelly sandy loam, (see Figure 2 below). The site is generally flat with 2-3% slopes in the westerly direction. The Geotechnical Engineering Study by GEO Group Northwest (Appendix A) indicates that there is medium sand material suitable for infiltration at depths of approximately 5 feet below grade in the southern half of the site. No groundwater seepage was encountered in the test pits, which reached 8 feet below grade. Please refer to Appendix A for a copy of the Geotechnical Engineering Study.

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EvB	Everett very gravelly sandy loam, 0 to 8 percent slopes	0.3	100.0%
Totals for Area of Interest		**0.3**	**100.0%**

Figure 2: Soils Map and Legend

Proposed Conditions:
The project proposes the construction of a new daycare within the 13,200 SF (1.73 AC) parcel, with parking lot access off the public alley located south of the site. Proposed on-site hard surfaces will include 1,914 SF of impervious rooftop, 370 SF of vegetated rooftop, 3,959 SF of uncovered asphalt parking, and 793 SF of uncovered concrete walkways/pads. An additional 172 SF of new asphalt pavement and 77 SF of replaced concrete sidewalk is located off-site in the public right-of-way (ROW). Proposed hard surfaces total 7,285 SF.

Stormwater runoff from all new impervious surfaces will be collected via on-site area drains and catch basins and conveyed to underground infiltration beds located beneath the grass play area in the southern portion of the site. Enhanced water quality treatment will be provided by a ConTech Filterra System for the 4,131 SF of proposed pollution generating impervious surfaces (PGIS) prior to infiltrating stormwater runoff on-site.

Site Analysis Conditions:
This project proposes to meet the requirements detailed in the City of Issaquah 2017 Stormwater Design Manual Addendum. Per Figure 2.3 of the City of Issaquah Addendum (shown as Figure 3 below), all minimum requirements apply to the new and replaced hard surfaces and converted vegetation areas on site. A summary of the minimum requirements is provided on the following page.

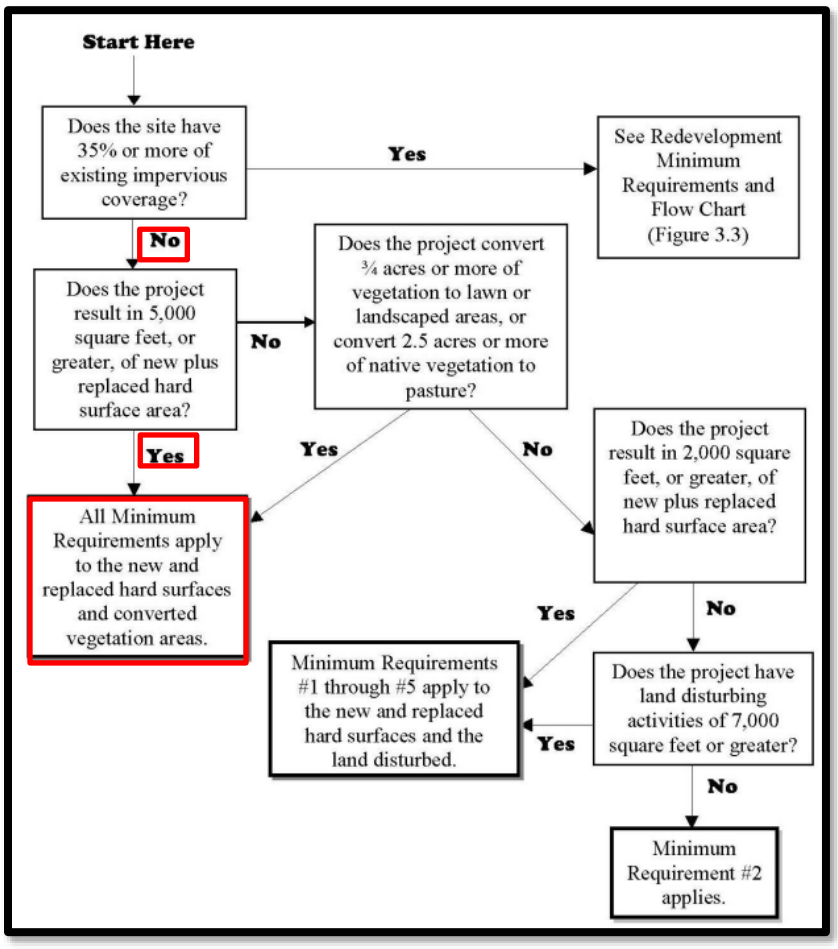

Figure 3: Drainage Review Flowchart

Minimum Requirement #1: Preparation of Stormwater Site Plans
This Stormwater Report has been prepared to satisfy Minimum Requirement #1.

Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan
A Temporary Erosion and Sediment Control Plan has been prepared for this project and is included with the Civil Plan Set. A Temporary Erosion and Sediment Control Report and Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the project using the City of Issaquah's template and is included in Appendix C of this Report. The 13 elements of the SWPPP are detailed in Section V of this Stormwater Report.

Minimum Requirement #3: Source Control of Pollution
Applicable source control BMPS that may be needed for this project are detailed in Section V of this Stormwater Report.

Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls
Runoff from the proposed improvements will follow existing drainage patterns. In the existing condition, stormwater runoff sheet flows through the lawn towards the western edge of the property. In the developed condition, stormwater from the new impervious areas onsite will be collected and conveyed to underground infiltration bed located beneath the grass play area in the southern portion of the site. All new pervious surfaces will disperse toward the natural discharge location. See Offsite Analysis in Section III of this Stormwater Report for more details on the drainage patterns of the site.

Minimum Requirement #5: On-Site Stormwater Management
List #2 in Section 2.4.5 of the Issaquah Addendum was used to select on-site stormwater BMPs for projects triggering Minimum Requirements #1 through #9. The selection of BMPs for each surface is summarized below:

Lawn and Landscaped Areas:
All new lawn and landscaped areas will meet post-construction soil quality and depth requirements in accordance with BMP T5.13 in Chapter 5 of Volume V of the 2014 Stormwater Maintenance Manual for Western Washington (SWMMWW).

Roofs:

1. **Full Dispersion:** Infeasible. A conforming 100 FT flow path is not available on-site downstream of the proposed improvements.

2. **Full Infiltration:** Feasible for 1,914 SF of proposed impervious rooftop areas (excludes 370 SF of vegetated rooftop). The Geotechnical Engineering Study by GEO Group Northwest (Appendix A) indicates that there is medium sand material suitable for infiltration at depths of approximately 5 feet below grade in the southern half of the site. Per Volume III, Section 3.1.1 of the 2014 SWMMWW, infiltration trenches should be designed at a ratio of 30 LF per 1,000 SF of tributary impervious surface when located within medium sand soils. Please refer to Section IV of this Stormwater Report for more information on the sizing and design of the proposed infiltration system.

Other Hard Surfaces:

1. **Full Dispersion:** Infeasible. A conforming 100 FT flow path is not available on-site.

2. **Permeable Pavement:** Infeasible. Due to the project being located within a Category 1 CARA, runoff from all new pollution generating impervious surfaces (PGIS) must be treated for water quality prior to infiltrating on-site. The Geotechnical Engineering Study by GEO Group Northwest (Appendix A) does not support the soil suitability criteria for providing treatment. In addition, the Geotechnical Engineering Study indicates that the soils near the area of the proposed pavement are unsuitable for infiltration near the surface. Infiltrative soils are not found until depths of 5 FT below grade are reached.

3. **Bioretention:** Infeasible. The Geotechnical Engineering Study by GEO Group Northwest (Appendix A) indicates that the soils on-site are unsuitable for infiltration near the surface. Infiltrative soils are not found until depths of 5 FT below grade are reached.

4. **Sheet Flow Dispersion:** Feasible for 606 SF of the proposed concrete walkways and pads. The proposed walkways and concrete pads located along the north and east sides of the daycare building and the walkways adjacent to the play area will disperse over the adjacent lawn and landscaped areas. Excess runoff that doesn't absorb into the surrounding vegetation will be collected via a series of area drains across the site and conveyed to the on-site infiltration system.

5. **Full Infiltration:** Feasible for remaining 264 SF of proposed walkways and 4,131 SF of proposed asphalt parking surfaces. The Geotechnical Engineering Study by GEO Group Northwest (Appendix A) indicates that there is medium sand material suitable for infiltration at depths of approximately 5 feet below grade in the southern half of the site. Per Volume III, Section 3.1.1 of the 2014 SWMMWW, infiltration trenches should be designed at a ratio of 30 LF per 1,000 SF of tributary impervious surface when located within medium sand soils. As required for sites located within a Category 1 CARA, runoff from all new PGIS must be treated for water quality prior to infiltrating on-site. Please refer to Section IV of this Stormwater Report for more information on the sizing and design of the proposed water quality and infiltration trench system.

Minimum Requirement #6: Runoff Treatment

Proposed pollution generating impervious surfaces (PGIS) on the project site total 4,131 SF. Typically, projects proposing less than 5,000 SF of new PGIS would be exempt from meeting the water quality requirements; however, since the site is located within a Category 1 CARA, water quality treatment is required prior to infiltrating stormwater runoff from tributary PGIS surfaces. The site is located within the Enhanced Water Quality Treatment Area. Please refer to Section IV of this Stormwater Report for more information on the sizing and design of the proposed water quality devices.

Minimum Requirement #7: Flow Control

As this project proposes under 10,000 SF of new impervious surface, it is exempt from flow control per Section 2.4.7.2 of the Issaquah Stormwater Design Manual Addendum. In addition, the project only results in a 0.0656 CFS increase in the peak 100-year flow using 15-minute timesteps. In the WWHM model, the project clearing limits were modeled as forested in the predeveloped condition, and hard surfaces that are fully infiltrated were excluded from the developed conditions model. Please refer to Appendix D of this Report for a copy of the WWHM modeling results.

Minimum Requirement #8: Wetlands Protection

There are no wetlands on or adjacent to the project site.

Minimum Requirement #9: Operations and Maintenance

An Operation and Maintenance Manual is included as Appendix B.

III. OFF-SITE ANALYSIS

In accordance with section 1.4.2 of the City of Issaquah 2017 Stormwater Design Manual Addendum and section I-3.5.3 of the 2019 SMMWW, an off-site analysis was performed on Wednesday, December 1st at approximately 9:00 am. The weather was around 50 degrees and cloudy in moderately wet conditions.

Task 1: Define and Map the Study Area
This site is contained within the Issaquah Creek Drainage Basin, in the Sammamish River Watershed. The area of analysis extends from the site discharge point along the southwestern corner of the site to approximately a quarter-mile downstream where stormwater runoff continues being conveyed through the Issaquah public stormwater system. A Downstream Map is provided in Figure 7 below.

Figure 7: Downstream Map

Task 2: Review All Available Information on the Study Area
Per King County resources, there have been no significant drainage complaints within a quarter mile downstream of the site. There are also no critical areas that were located.

Task 3: Field Inspect the Study Area
A field inspection was performed by Encompass Engineering & Surveying on Wednesday, December 1st. Please refer to Task 4 for a detailed description of the downstream drainage system and analysis.

Task 4: Describe the Drainage System and its existing and predicted problems
Stormwater runoff normally infiltrates into the onsite soils, but in the event of an extreme rain event it would sheet flow through a lawn area off the southern side of the site (A). This is the site's only Natural Discharge Area (NDA), which results in one Threshold Discharge Area (TDA). Once the stormwater runoff

sheet flows toward the southwestern corner of the site, it would begin to flow to the west down the adjacent alleyway (B). After about 450 FT, the stormwater collects into a catch basin at the end of the alleyway and at the crossing of 2nd Ave SE (C). After entering the catch basin, the stormwater is conveyed through the public stormwater system and heads south down 2nd Ave SE. After about 150 FT at the crossing of 2nd Ave SE and SE Andrews St, the stormwater is directed back to the west where it begins running parallel to SE Andrews St (D). In another 350 FT, the stormwater system crosses beneath Rainier Blvd S (E). From here, runoff continues being conveyed west underneath a large parking area until reaching Front St N (F). This is where the offsite analysis was concluded, as the ¼ mile downstream limit had been reached.

Element A – Runoff would sheet flow towards southern property edge

Element B – Runoff flows to the west down adjacent alley

Element C – Runoff enters catch basin at the end of the alley and turns south

Element D – Runoff conveyed back to the west along SE Andrews St

Element E – Runoff crosses Rainier Blvd S

Element F – Runoff conveyed under parking lot to the west until intersecting Front St N

IV. PERMANENT STORMWATER CONTROL PLAN

The project proposes the development of a daycare facility with parking lot access off of the adjacent public alley. Proposed on-site hard surfaces will include 1,914 SF of impervious rooftop, 370 SF of vegetated rooftop, 3,959 SF of uncovered asphalt parking, and 793 SF of uncovered concrete walkways/pads. An additional 172 SF of new asphalt pavement and 77 SF of replaced concrete sidewalk is located off-site in the public right-of-way (ROW). Proposed hard surfaces total 7,266 SF, of which 4,131 SF is pollution generating.

As this project proposes under 10,000 SF of impervious surface, it is exempt from flow control per Section 2.4.7.2 of the Issaquah Stormwater Design Manual Addendum. However, the project will implement flow control BMPs in accordance with Core Requirement #5.

The project proposes to utilize basic sheet flow dispersion for 606 SF of the proposed concrete walkways and pads. The proposed walkways and concrete pads located along the north and east sides of the daycare building and the walkways adjacent to the play area will disperse over the adjacent lawn and landscaped areas. Excess runoff that doesn't absorb into the surrounding vegetation will be collected via a series of area drains across the site and conveyed to the on-site infiltration system.

All remaining hard surfaces, excluding the 370 SF of vegetated rooftop areas, will be fully infiltrated on-site. Tributary hard surfaces to the infiltration system include the 264 SF of proposed walkways south of the daycare building, 4,131 SF of new asphalt pavement/parking, and 1,914 SF of new impervious rooftop area. The total tributary hard surface area is 6,309 SF.

Per the Geotechnical Engineering Study by GEO Group Northwest (Appendix A), there is medium sand material suitable for infiltration at depths of approximately 5 feet below grade in the southern half of the site. Per Volume III, Section 3.1.1 of the 2014 SWMMWW, infiltration trenches should be designed at a ratio of 30 LF per 1,000 SF of tributary impervious surface when located within medium sand soils. The total tributary impervious area is 6,309 SF; therefore, a 6,309 SF/1,000 SF x 30 LF = 189 LF long trench with a width of 2 FT is required to mitigate runoff from the site. This equates to a minimum infiltration area of 189 FT x 2 FT = 378 SF. Per the City of Issaquah Standard Detail, infiltration beds are allowed to have a maximum width of 5 FT; therefore, a total of 76 LF of trench would be required. The project is proposing a series of three (3) infiltration beds, each with a width of 5 FT and a length of 25 FT. The system provides a total of 390 SF of infiltration area, which exceeds the minimum required area of 378 SF. Each trench will be spaced 4 FT apart and the tributary flows will be split evenly between the three (3) trenches.

Prior to infiltrating stormwater runoff from the proposed 4,131 SF of PGIS, a FTPD 0404 ConTech Filterra system will be used to meet the Enhanced Water Quality standard. Per the WWHM data output provided in Appendix D, the water quality flowrate into the system is 0.0208 CFS and the 100-year peak flow is 0.102 CFS. The FTPD 0404 unit has been sized by ConTech to provide the required water quality. Please refer to the Civil Plan Set for details.

V. CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

1. Preserve Vegetation/Mark Clearing Limits
   a. The clearing limits are shown on the TESC plans surrounding all proposed construction activity.
   b. Retain the duff layer, native top soil and natural vegetation in an undisturbed state to the maximum degree practicable.
2. Establish Construction Access
   a. A stabilized construction entrance is shown for the project off of the alley.
   b. If sediment is tracked off site, the affected roadways are to be cleaned thoroughly at the end of each day.
3. Control Sediment
   a. The proposed sediment trap will be used to control flow rates during construction of the house and infrastructure improvements.
   b. Silt fence will also be utilized to control sediment and protect adjacent properties.

4. Install Sediment Controls
   a. The proposed sediment trap will be installed at the beginning of the project before major clearing and grading.
   b. Silt fence will also be installed during the initial phase of construction.
5. Stabilize Soils
   a. Stabilize expose and unworked soils. Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:
   - During the dry season (May 1 – September 30): 7 days
   - During the wet season (October 1 – April 30): 2 days
   - Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

   b. Stockpiled soils to be covered with plastic.
   c. All disturbed areas shall be stabilized with landscaping or some other method prior to final construction approval.
6. Protect Slopes
   a. Design and construct cut-and-fill slopes in a manner to minimize erosion.
7. Protect Drain Inlets
   a. Protect storm drain inlets made operable during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.
   b. Clean or remove and replace inlet protection devices when sediment has filled one third of the available storage (unless a different standard is specified by the product manufacturer).
8. Stabilize Channels and Outlets
   a. No channels or outlets are proposed.
9. Control Pollutants
   a. Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.
   b. Handle and dispose all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater.

c. Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.
d. Conduct maintenance, fueling and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.
e. Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland application, or to the sanitary sewer, with local sewer district approval.
f. Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.
g. Use BMPs to prevent contamination of stormwater runoff by pH modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters.
h. Adjust the pH of stormwater if necessary to prevent violations of water quality standards.
i. Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.
j. Obtain written approval from Ecology before using chemical treatment other than CO2 or dry ice to adjust pH.

10. Control Dewatering
    a. Dewatering is not anticipated at this site.
11. Maintain BMPs
    a. Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.
    b. Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed. All disturbed areas shall be stabilized with landscaping or some other method prior to final construction approval.
12. Manage the Project
    a. Maintain an updated SWPPP
13. Protect Low Impact Development BMPs.

I. SPECIAL REPORTS AND STUDIES

- Geotechnical Engineering Study by Geo Group Northwest, Inc. dated October 28th, 2014 (Appendix A).

VII. OTHER PERMITS

- Building permits

VIII. OPERATION AND MAINTENANCE MANUAL

An Operation and Maintenance Manual is included as Appendix B.

IX. DECLARATION OF COVENANT OR EASEMENT FOR PRIVATELY MAINTAINED FLOW CONTROL AND TREATMENT FACILITIES

This document will be prepared and submitted if requested by the City of Issaquah.

X. DECLARATION OF COVENANT OR EASEMENT FOR ON-SITE STORMWATER MANAGEMENT FACILITIES

This document will be prepared and submitted if requested by the City of Issaquah.

XI. BOND QUANTITIES WORKSHEET

Bond Quantities will be prepared and submitted if requested by the City of Issaquah.

Appendix A

Geotechnical Engineering Study by GEO Group Northwest, Inc. dated October 28, 2014

GEOTECHNICAL ENGINEERING STUDY

PROPOSED MULTI-UNIT 4-STORY
RESIDENTIAL STRUCTURE
355 East Sunset Way
Issaquah, Washington
G-3733

Prepared for

Mr. D. J. Loveridge
19538 SE 51st Street
Issaquah, WA 98027

October 28, 2014

By

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GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists
& Environmental Scientists

October 28, 2010

Project No. G-3733

Mr. D. J. Loveridge
19538 SE 51st Street
Issaquah, WA 98027

Subject: **GEOTECHNICAL ENGINEERING STUDY**
Proposed 4-Story Multi-Unit Residential Structure
355 East Sunset Way
Issaquah, Washington

Dear Mr. Loveridge:

GEO Group Northwest, Inc., is pleased to present this geotechnical engineering study for the above subject proposed 4-story multi-unit residential structure. The purpose of the study is to evaluate the site conditions and provide geotechnical design criteria and recommendations pertaining to the proposed construction of the wood-framed residential structure. A site development plan was not available, however based on discussions with Mr. Loveridge we understand parking will be under the building and the parking will be approximately at-grade. Final grade changes to the site will be minimal.

The scope of work performed for this study included reviewing the area geologic map, a site reconnaissance, excavation of four test pits to evaluate the subsurface conditions, engineering analysis, and preparation of this report. A city storm drain system is not available so on-site infiltration of storm water is planned. The subsurface soils were evaluated for infiltration feasibility and are acceptable for infiltration along the alley to the south.

SITE CONDITIONS

The site is located on the south side of East Sunset Way, as illustrated on the Vicinity Map, Plate 1. The lot is located in a residential area and is bordered by an alley to the south and by residential lots to the west, east and south. The lot is 13,200 sf in size, measures 110 feet east/west by 120 feet north/south and is relatively flat, as illustrated on the Site Plan, Plate 2. We understand the proposed structure will have property line setbacks of 5 feet along the north

property line, 10 feet on the side yard and 20 feet along the alley to the south. A sanitary sewer main line is located in the alley and the water main is located in East Sunset Way. An existing single family residence is located on the lot, which will be removed as part of the site redevelopment.

SUBSURFACE CONDITIONS

According to the area geologic map[1], the site is located at the contact between Fan Deposits (Qf) and Younger Alluvium (Qyal). The Fan Deposits are described as boulders, cobbles, and sand deposited in lobate form where streams emerge from confining valleys and the reduced gradients cause some of their sediment loads to be deposited. The Younger Alluvium is described as moderately sorted cobble gravel, pebbly sand, and sandy silt mapped along the major stream channels.

The project site is stippled on the geologic map which indicates it is subject to inundation (flooding) by modern stream flows under present land use and climatic conditions. We recommend verifying with the City of Issaquah as to whether the site is currently mapped as being in the flood plain.

GEO Group Northwest, Inc., investigated the subsurface site conditions on September 9, 2014 by excavating four test pits. The test pits varied in depth from 6 feet to 9 feet below the ground surface. The location of the test pits are illustrated on the Site Plate 2. Based on the soils encountered, the site soils generally consist of 1 foot to 1.5 feet of topsoil, underlain by loose to medium dense silty sand with some gravel to a depth of 4 feet to 5.5 feet. Underlying the silty sand the soil consists of dense gravelly sand with some cobbles, with the exception of test pit TP-3 which encountered a sandy gravel lense from 4 feet to 5.2 feet, underlain by dense silty sand. The dense to very dense gravelly sand and dense silty sand is suitable for supporting the proposed building foundation loads. The gravelly sand encountered in the southeastern and southwestern corners of the lot (TP-1 and TP-2) are suitable for infiltration. No groundwater or

[1] Booth D. B., Minard J. P, 1992, "Geologic Map of the Issaquah 7.5' Quadrangle, King County, Washington," U.S. Geological Survey, Map MF-2206, Scale 1:24,000.

seepage was encountered. For a more detailed description of the soils encountered please refer to the test pit logs in Appendix A.

SEISMIC CONSIDERATIONS

Soils below a depth of 4 to 5.5 feet are dense to very dense. the site is seismically classified as Site Class C, in accordance with the International Building Code and ASCE Chapter 20.

The potential for liquefaction and/or lateral spreading is very low. No known faults intersect the subject property and the risk of surface rupture, as a result of a large magnitude seismic event, is interpreted to be low. No geotechnical seismic mitigation measures are recommended, with the exception of the addition of design criteria for seismically induced dynamic soil loads on permanent basement walls and retaining walls (should permanent basement walls or permanent retaining walls be incorporated into the site development plans).

DISCUSSIONS AND RECOMMENDATIONS

The lot is geotechnically suitable for constructing the proposed residential structure. The building may be supported on a conventional spread footing foundation. Foundation footings should extend down to the dense undisturbed soil or be supported on lean-mix concrete, crushed rock, or structural fill that extends down to the dense soil.

INFILTRATION

A high groundwater table was not encountered in the test pits. The gravelly sand material encountered at a depth of 5 feet in TP-1 and 4.5 feet in TP-2 in the southern portion of the site is suitable material for infiltration using either dry wells or infiltration trenches. We recommend dry wells and infiltration trenches be protected from clogging by installing a catch basin trap between the source and dry well/trench, as illustrated on the Infiltration Detail, Plate 3.

SITE PREPARATION AND GENERAL EARTHWORK RECOMMENDATIONS

Erosion Control

Prior to site disturbance, we recommend installing temporary erosion control silt fencing along the perimeter of the site. A crushed rock construction entrance should be installed to mitigate tracking of mud onto the alley and street. Permanent erosion control, upon completion of the project, should consist of grass, plants, and mulch.

Site Preparation

The footprint of the proposed new structure should be cleared and grubbed. Top soil should be stripped and loose to medium dense soil be removed so foundation footings can be supported directly on undisturbed dense soil, or be supported on lean-mix concrete, crushed rock, or structural fill that extends down to the dense soil. The depth to suitable bearing soil for foundations varied between 4.5 feet to 5.5 feet below the existing grade, as noted on the test pit logs.

The under-building parking garage slab-on-grade floor may be supported on compacted structural fill that extends down to the dense native soil or on a minimum of two feet of structural fill. To support the slab on a minimum of 2 feet of structural fill, we recommend removing all loose soil, compacting the medium dense base subgrade soil with a vibratory drum roller and building the subgrade backup with structural fill. Similar subgrade preparation is recommended for supporting driveway pavements, sidewalks, patios, and porches.

Cuts and Fills

A maximum cut of up to 5.5 feet is anticipated to reach suitable bearing soils for the spread footing foundation. Temporary cuts greater than four feet in height should be sloped at an inclination no steeper than 1H:1V (Horizontal to Vertical) for worker safety. Permanent cut and fill slopes are not planned at this time, but should be inclined no steeper than 2H:1V and loose material on slopes should be compacted to a minimum of 90 percent of the material's maximum dry density.

Structural Fill

Structural fill is defined as fill soils supporting building foundation loads, slab-on-grade floors, patios, porches, retaining walls, sidewalks, and pavement. Top soil and other dark brown soils containing organics should not be used as structural fill. The majority of the site soils contain silt and will likely be moisture sensitive. It may be possible to use the site soil as structural fill during dry summer months provided the material achieves the compaction specifications. This will depend on weather conditions, the materials moisture content, and exposure to weather. During wet weather we recommend structural fill material consist of a free draining, granular material, containing no more than 5 percent fines (silt and clay-size particles passing the No. 200 mesh sieve), be free of organic and other deleterious substances, and have a maximum size of 3-inches.

Structural fill should be placed at the material's optimum moisture content and be placed and compacted in 10-inch thick loose lifts, or less. Below foundations and slab-on-grade floors, structural fill should be compacted to a minimum of 95 percent of the materials maximum dry density, based on Modified Proctor (ASTM D-1557). Structural fill below the driveway and sidewalks should be compacted to a minimum of 90 percent, with the exception of the top 12-inches which should be compacted to 95 percent.

FOUNDATION RECOMMENDATIONS

The building may be supported on a conventional spread footing foundation. The foundation footings may be supported directly on undisturbed dense soil, or on structural fill, crushed rock, or lean-mix concrete that extends down to the suitable bearing soil. Structural fill should be compacted 95% and create a prism that extends out and below the footing at 1H:1V to properly transfer the building loads to bearing stratum. Crushed rock and lean-mix concrete may extend vertically below footings provided the width of the trench (rock or lean-mix filled) is as wide as the footing and the footing is centered over the trench. Crushed rock should be compacted in 12-inch thick lifts with a hoe-pack compactor and consist of clean 1.5 to 3-inch (no minus) angular fractured rock. The following foundation design criteria are applicable to spread footing foundations that are supported as described above:

- Allowable soil bearing pressure, including all dead and live loads:
  Dense site soils, structural fill, and lean mix: = 2,500 psf

- Minimum depth to bottom of perimeter footing below adjacent final exterior grade: = 18 inches

- Minimum depth to bottom of interior footings below top of floor slab: = 12 inches

- Minimum width of wall footings: = 16 inches

- Minimum lateral dimension of column footings: = 24 inches

- Estimated maximum post-construction settlement: = less than1/2 inch

- Estimated post-construction maximum differential settlement across building width: = less than1/2 inch

A one-third increase in the above allowable bearing pressures can be used when considering short-term transitory wind or seismic loads. Lateral loads can also be resisted by friction between the foundation and the supporting compacted fill subgrade or by passive earth pressure acting on the buried portions of the foundations. For the latter, the foundations must be poured "neat" against compacted soil. Our recommended parameters are as follows:

- Passive Pressure (Lateral Resistance)
  - 350 pcf equivalent fluid weight for dense site soils and structural fill

- Coefficient of Friction (Friction Factor)
  - 0.35 for dense site soils and structural fill

SLAB-ON-GRADE FLOOR RECOMMENDATIONS

Slab-on-grade floors should be supported on dense native soil or on a minimum of 2 feet of structural fill. We recommend removing the loose soils and compacting the medium dense subgrade base soil with a vibratory drum roller compactor. The compacted medium dense base soil should be a minimum depth of 2 feet below the bottom of the slab. The subgrade should then be brought back up with structural fill compacted to 95 percent of the material's maximum dry density.

The slab floor should be placed on a capillary break and a vapor barrier installed to prevent wicking of moisture up through the slab. The capillary break should consist of a minimum of six (6) inch thick free-draining layer of gravel or crushed rock containing no more than five (5) percent passing the No. 4 (1/4-inch mesh size) sieve. Suitable capillary break material includes 5/8-inch crushed (chip) rock (no minus fraction). The vapor barrier should consist of a 10-mil reinforced plastic membrane, such as Moistop® by Fortifiber Corporation, installed between the capillary break and concrete slab. Two to four inches of sand may be placed over the vapor barrier membrane for protection during construction (optional).

DRAINAGE

During construction, water should not be allowed to stand in areas where footings, slabs, or pavements are to be constructed. If feasible, the finished ground of the site should be graded so surface water is directed away from the building foundation.

Footing Drain

The footing drain may be eliminated provided subsurface water can drain into the more permeable gravelly sand material that underlies the site. To accomplish this, the perimeter foundation backfill material should consist of a free-draining granular material and the footings bear directly on the dense gravelly sand or the footings should be supported on free-draining structural fill or clean crushed rock that extends down to the dense gravelly sand.

If a footing drain is required, the footing drain should consist of a four (4) inch minimum diameter, perforated, rigid drain pipe laid at or near the bottom of the footing. The perforated drain should be bedded in clean drain rock or crushed rock and the rock protected with geotextile filter fabric, such as Mirafi 140N, or equivalent, as illustrated on the Footing Drain Detail, Plate 4. Roof drains, yard drains, and other drain lines should not be connected to the footing drain system. Footing drains should be tight-lined separately to a dry well or infiltration trench separate from the roof drain system. Installation of clean-outs is recommended to allow periodic maintenance of the footing drain and roof drain systems.

PLAN REVIEW AND CONSTRUCTION MONITORING

It is recommended that GEO Group Northwest be retained to perform a general review of the final design plans and specifications to verify that the earthwork, foundation, and other recommendations herein have been properly interpreted and implemented.

It is recommended that we be retained to provide geotechnical construction monitoring services for quality assurance of the earthwork. This will allow us to confirm that the subsurface conditions are consistent with those described in the report and allow design changes in the event subsurface conditions differ from those anticipated. It will also allow us to evaluate whether the geotechnical aspects of the construction activities conform to the plans and specifications.

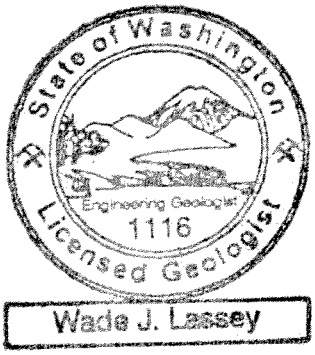
LIMITATIONS

This report has been prepared for the specific application to this project. The findings and recommendations stated herein are based on our field observations, the subsurface conditions encountered in our site exploration, our experience, and judgement. The recommendations are our professional opinion derived in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area and within the budget constraint. No warranty is expressed or implied. In the event that soil conditions vary during site work, GEO Group Northwest, Inc., should be notified and the recommendations herein re-evaluated, and where necessary, be revised.

We appreciate the opportunity to provide you with geotechnical engineering services. Please contact us if you have any questions regarding this report or if additional information is needed.

Sincerely,
GEO GROUP NORTHWEST, INC.

Wade J. Lassey
Engineering Geologist



William Chang, P.E.
Principal

Attachments:

Illustrations

- Plate 1 - Vicinity Map
- Plate 2 - Site Plan
- Plate 3 - Typical Dry Well & Infiltration Trench Detail
- Plate 4 - Footing Drain Detail

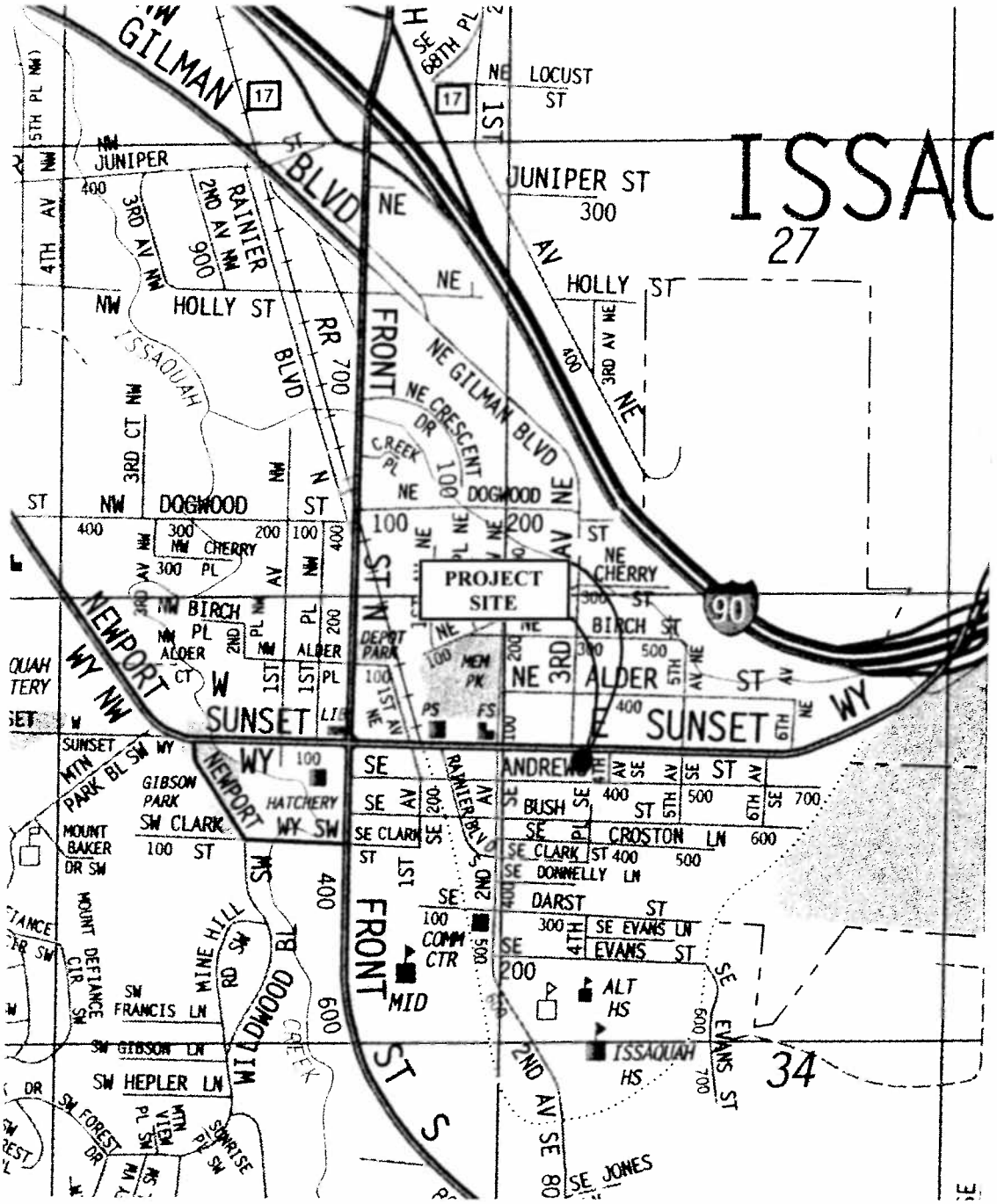
Appendix A - USCS Soil Classification Legend & Test Pit Logs

Adapted from "The Thomas Guide," 2007.

0 1000' 2000'

Approximate Scale: 1 inch =1000 feet

N



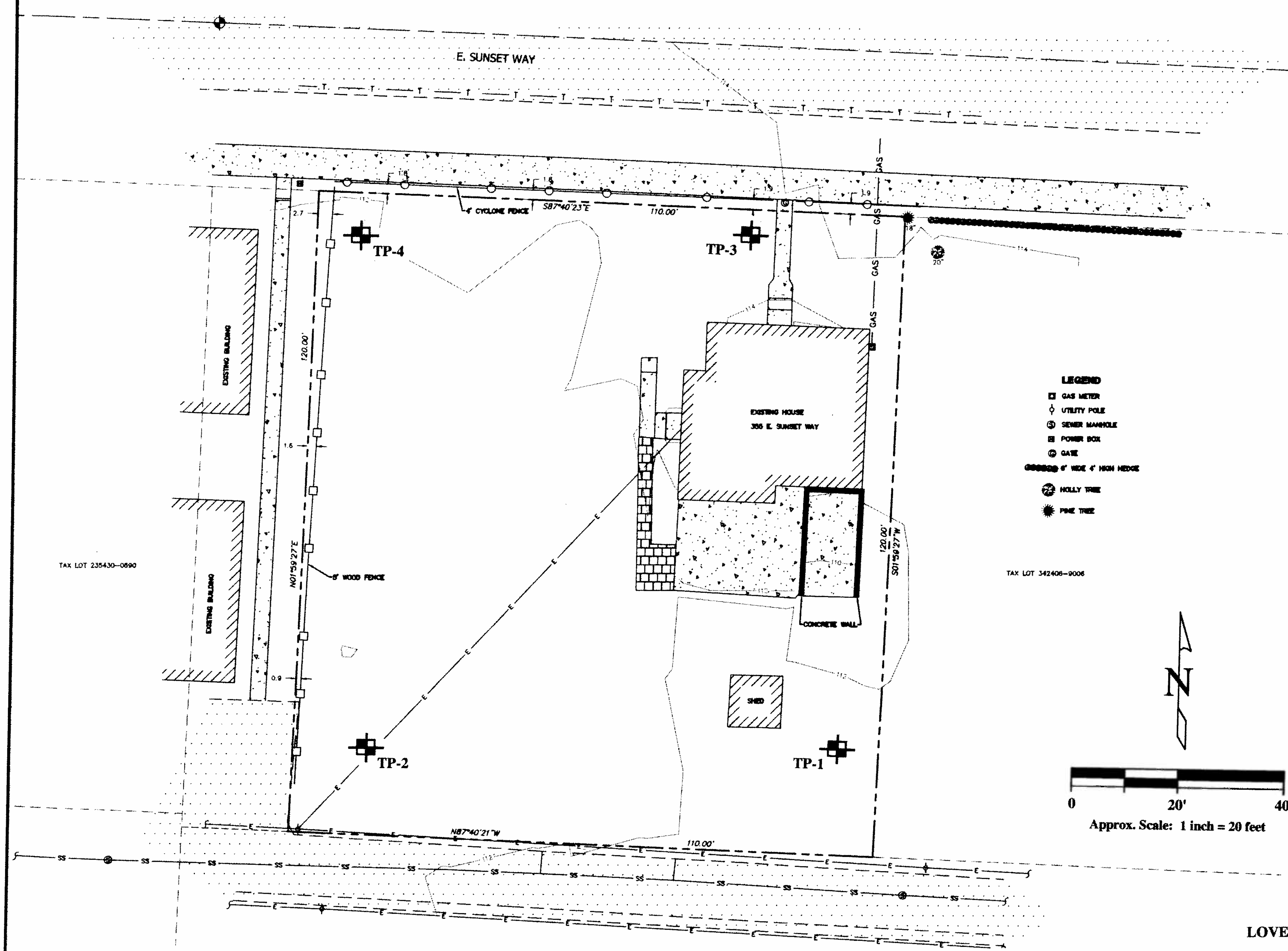
GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

VICINITY MAP

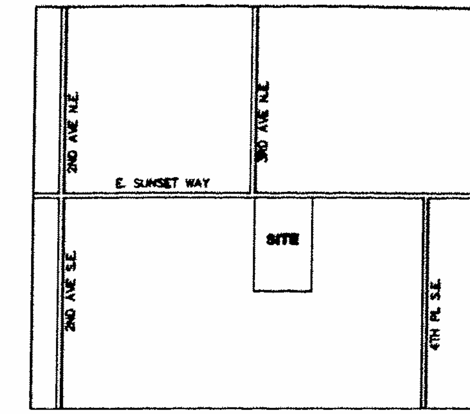
Proposed 4-Story Multi-Unit Residential Structure
355 East Sunset Way
Issaquah, Washington

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
As Shown	10/28/14	WJL	WC	G-3733	1

N.E. 1/4 OF N.W. 1/4 OF SECTION 34, T. 24 N., R. 06 E., W.M.
CITY OF ISSAQUAH, STATE OF WASHINGTON



LEGEND
- GAS METER
- UTILITY POLE
- SEWER MANHOLE
- POWER BOX
- GATE
- 6' WIDE 4' HIGH HEDGE
- HOLLY TREE
- PINE TREE



VICINITY MAP
N.T.S.

LEGAL DESCRIPTION

THAT PORTION OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 34, TOWNSHIP 24 NORTH, RANGE 6 EAST, W.M., IN KING COUNTY, WASHINGTON, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE SOUTH LINE OF MILL STREET, WHICH IS 30 FEET SOUTH AND EAST OF THE NORTHWEST CORNER OF SAID SUBDIVISION;
THENCE EAST ALONG SAID SOUTH LINE 110 FEET;
THENCE SOUTH 120 FEET;
THENCE WEST 110 FEET;
THENCE NORTH 120 FEET TO THE POINT OF BEGINNING.

SITUATE IN THE COUNTY OF KING, STATE OF WASHINGTON.

DATUM

NAVD 88

BENCHMARK

1" BRASS DISK WITH PUNCH MARK, SET 1.72' BELOW GRADE, IN A FOGRITE MONUMENT CASE LOCATED IN THE CENTER OF THE INTERSECTION OF FRONT STREET AND SUNSET WAY
ELEVATION=94.15 FEET

INSTRUMENTATION

INSTRUMENT USED: 5 SECOND TOTAL STATION.

FIELD SURVEY WAS BY CLOSED TRAVERSE LOOPS, MINIMUM CLOSURE OF LOOPS WAS 1:22,000, IN ACCORDANCE WITH WAC 332-130-090

N

0 20' 40'
Approx. Scale: 1 inch = 20 feet

LEGEND

TP-1 Test Pit Number & Approximate Location

PLATE 2

SITE PLAN
LOVERIDGE MULTI-UNIT RESIDENTIAL
355 EAST SUNSET WAY
ISSAQUAH, WASHINGTON

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

WILLIAM SHUPE HOLMBERG
STATE OF WASHINGTON
PROFESSIONAL LAND SURVEYOR
REGISTERED

DJ LOVERIDGE
355 E. SUNSET WAY

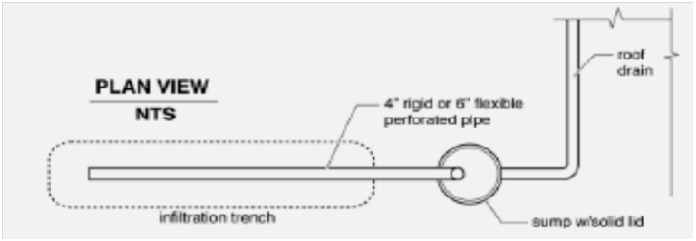
BOUNDARY/TOPOGRAPHY PLAN

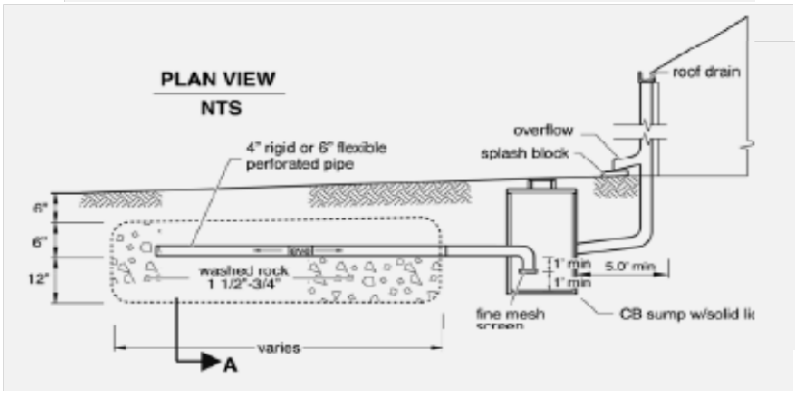
Encompass ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
108 East 2nd Street • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

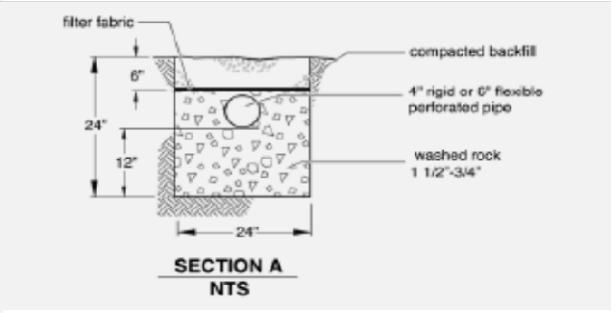
JOB NO.	14642
DATE	9/24/14
SCALE	1"=10'
DESIGNED	WSH
DRAWN	JEF
CHECKED	WSH
APPROVED	WSH

SHEET 1 OF 1

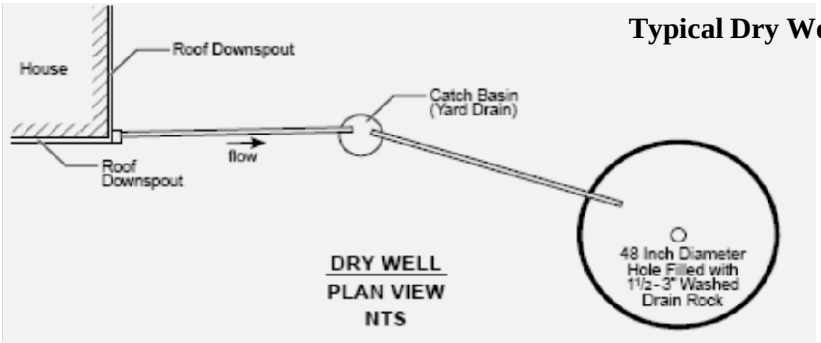
Typical Trench Infiltration System

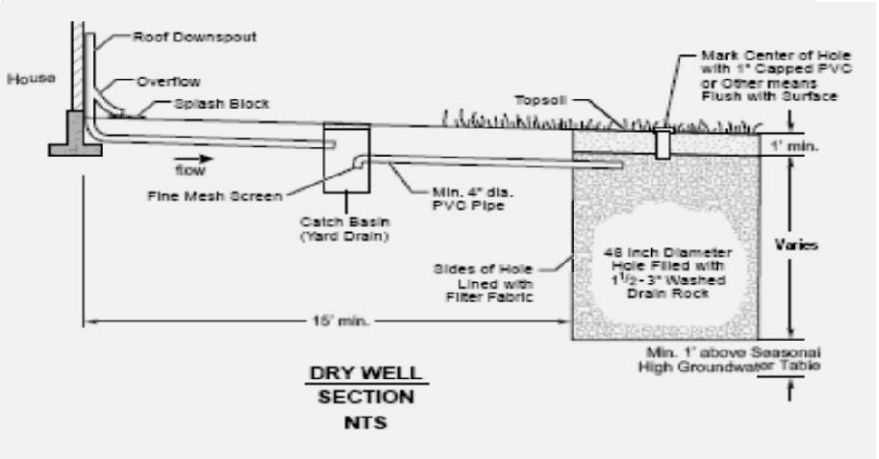






Typical Dry Well Infiltration System





The above infiltration trench and dry well figures were adapted from the King County Surface Water Design Manual, Small Project Drainage Requirements, January 9, 2009, Figures C.2.2.B & C.2.2.C

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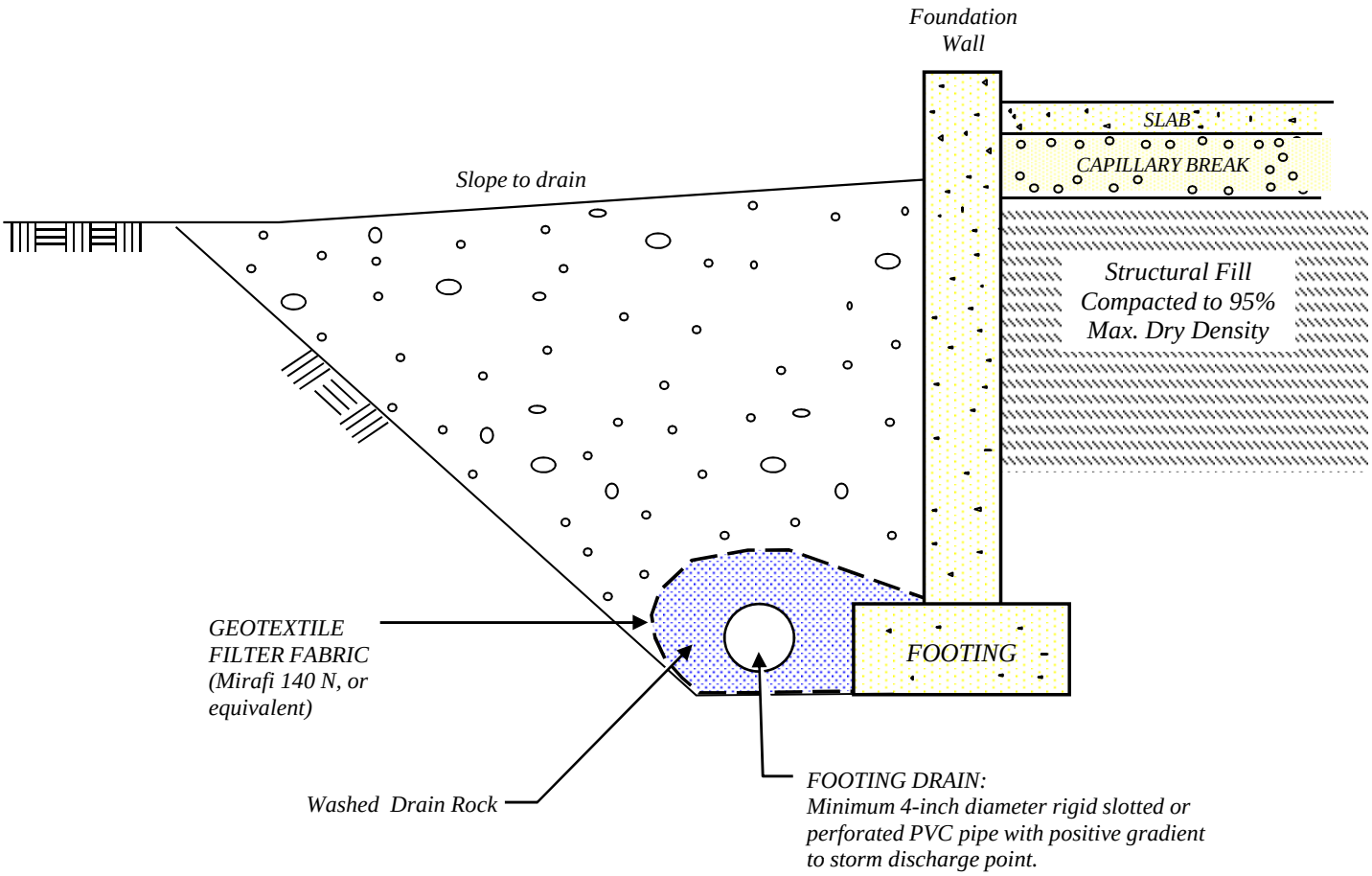
INFILTRATION DETAIL

Proposed Duplex
660 SE Andrew Street
Issaquah, Washington

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
NTS	10/28/14	WJL	WC	G-3733	3



NOT TO SCALE

NOTES:

1.) Do not replace rigid PVC pipe with flexiible corrugated plastic pipe.

2.) Perforated or slotted PVC pipe should be tight jointed and laid with perforations or slots down, with positive gradient to discharge.

3.) Do not connect roof downspouts into the footing drain system. Footing drains should discharge into a seperate dry well system from the roof drains.

4.) Interior backfill below slab-on-grade floors should be compacted to 95% of the maximum dry density. Please refer to report for slab subgrade preparation recommendations.

5.) The footing drains may be eliminated. If the footing drains are to be eliminated please refer to the 'Drainage' section of the report.

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Geotechnical Engineers, Geologists, & Environmental Scientists

TYPICAL FOOTING DRAIN DETAIL

Proposed 4-Story Multi-Unit Residential Structure
355 East Sunset Way
Issaquah, Washington

SCALE	DATE	MADE	CHKD	JOB NO.	PLATE
NONE	10/28/14	WJL	WC	G-3733	4

APPENDIX A

USCS Soil Classification Legend

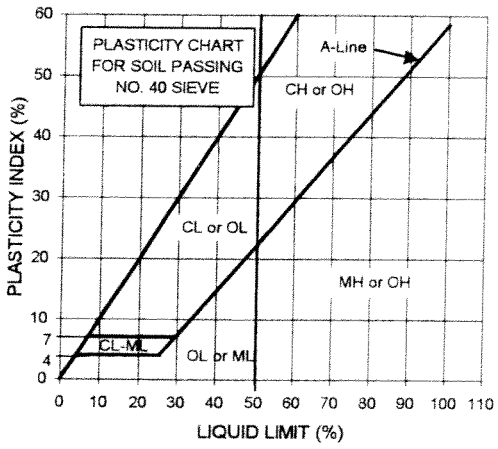
&

Test Pit Logs

LEGEND OF SOIL CLASSIFICATION AND PENETRATION TEST

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOILS	GRAVELS (More Than Half Coarse Grains Larger Than No. 4 Sieve)	CLEAN GRAVELS (little or no fines)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURE, LITTLE OR NO FINES	DETERMINE PERCENTAGES OF GRAVEL AND SAND FROM GRAIN SIZE DISTRIBUTION CURVE	Cu = (D60 / D10) greater than 4 Cc = ($D30^2$) / (D10 * D60) between 1 and 3	
			GP	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES LITTLE OR NO FINES		NOT MEETING ABOVE REQUIREMENTS	
		DIRTY GRAVELS (with some fines)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES		CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE or P.I. LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS:		ATTERBERG LIMITS ABOVE "A" LINE or P.I. MORE THAN 7
More Than Half by Weight Larger Than No. 200 Sieve	SANDS (More Than Half Coarse Grains Smaller Than No. 4 Sieve)	CLEAN SANDS (little or no fines)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		Cu = (D60 / D10) greater than 6 Cc = ($D30^2$) / (D10 * D60) between 1 and 3	
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	< 5% Fine Grained: GW, GP, SW, SP	NOT MEETING ABOVE REQUIREMENTS	
		DIRTY SANDS (with some fines)	SM	SILTY SANDS, SAND-SILT MIXTURES	> 12% Fine Grained: GM, GC, SM, SC	CONTENT OF FINES EXCEEDS 12%	ATTERBERG LIMITS BELOW "A" LINE with P.I. LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	5 to 12% Fine Grained: use dual symbols		ATTERBERG LIMITS ABOVE "A" LINE with P.I. MORE THAN 7
FINE-GRAINED SOILS	SILTS (Below A-Line on Plasticity Chart, Negligible Organic)	Liquid Limit < 50%	ML	INORGANIC SILTS, ROCK FLOUR, SANDY SILTS OF SLIGHT PLASTICITY			
		Liquid Limit > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOIL			
	CLAYS (Above A-Line on Plasticity Chart, Negligible Organic)	Liquid Limit < 30%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, CLEAN CLAYS			
		Liquid Limit > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS			
More Than Half by Weight Larger Than No. 200 Sieve	ORGANIC SILTS & CLAYS (Below A-Line on Plasticity Chart)	Liquid Limit < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY			
		Liquid Limit > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY			
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS			



SOIL PARTICLE SIZE

FRACTION	U.S. STANDARD SIEVE			
	Passing		Retained	
	Sieve	Size (mm)	Sieve	Size (mm)
SILT / CLAY	#200	0.075		
SAND				
FINE	#40	0.425	#200	0.075
MEDIUM	#10	2.00	#40	0.425
COARSE	#4	4.75	#10	2.00
GRAVEL				
FINE		19	#4	4.75
COARSE		76		19
COBBLES	76 mm to 203 mm			
BOULDERS	> 203 mm			
ROCK FRAGMENTS	> 76 mm			
ROCK	>0.76 cubic meter in volume			

GENERAL GUIDANCE OF SOIL ENGINEERING PROPERTIES FROM STANDARD PENETRATION TEST (SPT)

SANDY SOILS				SILTY & CLAYEY SOILS		
Blow Counts N	Relative Density %	Friction Angle ϕ, degree	Description	Blow Counts N	Unconfined Strength q_u, tsf	Description
0 - 4	0 -15		Very Loose	< 2	< 0.25	Very soft
4 - 10	15 - 35	26 - 30	Loose	2 - 4	0.25 - 0.50	Soft
10 - 30	35 - 65	28 - 35	Medium Dense	4 - 8	0.50 - 1.00	Medium Stiff
30 - 50	65 - 85	35 - 42	Dense	8 - 15	1.00 - 2.00	Stiff
> 50	85 - 100	38 - 46	Very Dense	15 - 30	2.00 - 4.00	Very Stiff
				> 30	> 4.00	Hard

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists
13240 NE 20th Street, Suite 12, Bellevue, WA 98005
Phone (425) 649-8757, Fax (425) 649-8758

PLATE A1

TEST PIT NO. TP-1

LOGGED BY WJL EXCAVATION DATE 9/9/14 GROUND ELEV. 111.8 feet (±)

DEPTH ft.	USCS	SOIL DESCRIPTION	Sample No.	Moisture %	COMMENTS
	SM	**Concrete rubble and Silty SAND**, brown, fine-grained, medium dense, damp **(Driveway Fill)**			- Probed 16"
	SM	**Silty SAND**, reddish brown, fine-grained, loose, some pebble gravel, damp	S1	23.9	- Probed 18"
5			S2	21.4	
	SW	**Gravelly SAND**, brown, fine-coarse grained sand, dense to very dense, some cobbles, damp	S3	5.4	Soils Are Suitable For Infiltration Below 5 feet.
			S4	3.9	Dense soil suitable for Foundation Soil Bearing at 5 feet.
10		Total Depth = 9 feet No Water Seepage Location: SE Corner of Lot			

TEST PIT NO. TP-2

LOGGED BY WJL EXCAVATION DATE 9/9/14 GROUND ELEV. 112.2 feet (±)

DEPTH ft.	USCS	SOIL DESCRIPTION	Sample No.	Moisture %	COMMENTS
	SM	**Silty SAND**, dark brown, fine grained, loose, with some organics **(Topsoil)**	S1	24.1	
	SM	**Silty SAND**, reddish brown, fine-grained, loose to medium dense, some pebble gravel, damp	S2	18.4	- Probed 15"
5					
	SM	**Gravelly SAND**, brown, fine to medium grained sand with some coarse, dense to very dense, damp to moist, some cobbles, damp to moist	S3	6.2	Soils Suitable For Infiltration Encountered Below 4.5 feet.
			S4	8.6	Dense soil suitable for Foundation Soil Bearing at 4.5 feet.
10		Total Depth = 8 feet No Water Seepage Location: SW Corner of Lot			

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

TEST PIT LOGS

Proposed 4-Story Multi-Unit Residential Structure
355 East Sunset Way
Issaquah, Washington

JOB NO. G-3733 DATE 10/28/14 PLATE A2

TEST PIT NO. TP-3

LOGGED BY WJL **EXCAVATION DATE** 9/9/14 **GROUND ELEV.** 113.8 feet (±)

DEPTH ft.	USCS	SOIL DESCRIPTION	Sample No.	Moisture %	COMMENTS
	SM	**Silty SAND**, brown, fine-grained, some gravel, loose, damp, with some roots and mixed black organic topsoil layers **(Fill / Disturbed Soil Near Existing House)**	S1	16.1	- Probed 24"
5	GW	**Sandy Gravel**, brown, loose to medium dense, fine to medium grained sand, some cobbles, damp	S2	5.8	- Probed 13"
	SM	**Silty SAND**, brown, fine-grained, dense, damp	S3	19.4	- Probed 3"
10		Total Depth = 6 feet No Water Seepage Location: NE Corner of Lot			Dense soil suitable for Foundation Soil Bearing at 5.3 feet.

TEST PIT NO. TP-4

LOGGED BY WJL **EXCAVATION DATE** 9/9/14 **GROUND ELEV.** 112.0 feet (±)

DEPTH ft.	USCS	SOIL DESCRIPTION	Sample No.	Moisture %	COMMENTS
	SM	**Silty SAND**, black, fine grained, loose, with some organics & roots **(Topsoil)**			- Probed 20"
	SM	**Silty SAND**, reddish brown, fine-grained, loose to medium dense, some gravel, occasional cobbles damp	S1	18.0	- Probed 8"
5			S2	20.0	- Probed 10"
	SP-SM	**Gravelly SAND with some silt**, brown, fine to medium grained sand, dense to very dense, some cobbles, moist	S3	9.4	Dense soil suitable for Foundation Soil Bearing at 5.5 feet.
10		Total Depth = 8 feet No Water Seepage Location: NW Corner of Lot			

GEO Group Northwest, Inc.
Geotechnical Engineers, Geologists, & Environmental Scientists

TEST PIT LOGS

Proposed 4-Story Multi-Unit Residential Structure
355 East Sunset Way
Issaquah, Washington

JOB NO. G-3733 **DATE** 10/28/14 **PLATE** A3

Appendix B

Operation and Maintenance Manual

Table V-A.1: Maintenance Standards - Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance and inspection access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g.,rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed engineer in the state of Washington should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (if Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.

Table V-A.1: Maintenance Standards - Detention Ponds (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Ponds Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation If settlement is apparent, measure berm to determine amount of settlement Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms over 4 feet in height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway	Emergency Overflow/Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

Table V-A.2: Maintenance Standards - Infiltration

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Poisonous/Noxious Vegetation	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Contaminants and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Rodent Holes	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events. (A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway and Berms over 4 feet in height.	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the compost media.
Vault	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Table V-A.23: Maintenance Standards - Vegetated Roofs

Activity	Objective	Schedule	Notes
Structural and Drainage Components			
Clear inlet pipes: Remove soil substrate, vegetation or other debris.	Maintain free drainage of inlet pipes.	Twice annually.	
Inspect drain pipe: Check for cracks settling and proper alignment, and correct and re-compact soils or fill material surrounding pipe, if necessary.	Maintain free drainage of inlet pipes.	Twice annually.	
Inspect fire ventilation points for proper operation	Fire and safety.	Twice annually.	
Maintain egress and ingress: Clear routes of obstructions and maintained to design standards.	Fire and safety.	Twice annually.	
Insects: (see note)			Roof garden design should provide drainage rates that do not allow pooling of water for periods that promote insect larvae development. If standing water is present for extended periods correct drainage problem. Chemical sprays should not be used.
Prevent release of contaminants: Identify activities (mechanical systems maintenance, pet access, etc.) that can potentially release pollutants to the roof garden and establish agreements to prevent release.	Water quality protection.	During construction of roof and then as determined by inspection.	Any cause of pollutant release should be corrected as soon as identified and the pollutant removed.
Vegetation and Growth Medium			
Invasive or nuisance plants: Remove manually and without herbicide applications.	Promote selected plant growth and survival, maintain aesthetics.	Twice annually.	At a minimum, schedule weeding with inspections to coincide with important horticultural cycles (e.g., prior to major weed varieties dispersing seeds).
Removing and replacing dead material: (see note)	See note.	Once annually.	Normally, dead plant material will be recycled on the roof; however specific plants or aesthetic considerations may warrant removing and replacing dead material (see manufacturer's recommendations).
Fertilization: If necessary apply by hand (see note)	Plant growth and survival.	Determined by inspection.	Extensive roof gardens should be designed to not require fertilization after plant establishment. If fertilization is necessary during plant establishment or for plant health and survivability after establishment, use an encapsulated, slow release fertilizer (excessive fertilization can contribute to increased nutrient loads in the stormwater system and receiving waters).
Mulching: (see note)			Avoid application of mulch on extensive roof gardens. Mulch should be used only in unusual situations and according to the roof garden provider guidelines. In conventional landscaping mulch enhances moisture retention; however, moisture control on a vegetated roof should be through proper soil/growth media design. Mulch will also increase establishment of weeds.
Irrigate: Use subsurface or drip irrigation.		Determined by inspection and only when absolutely necessary for plant survival.	Surface irrigation systems on extensive roof gardens can promote weed establishment, root development near the drier surface layer of the soil substrate, and increase plant dependence on irrigation. Accordingly, subsurface irrigation methods are preferred. If surface irrigation is the only method available, use drip irrigation to deliver water to the base of the plant.

Source: Eastern Washington LID Guidance Manual (June 2013)

Appendix C

Temporary Erosion and Sediment Control Report and Stormwater Pollution Prevention Plan

CITY OF ISSAQUAH
DEVELOPMENT SERVICES

Development Services
1775 – 12th Ave. NW | P.O. Box 1307
Issaquah, WA 98027
425-837-3100
issaquahwa.gov

Temporary Erosion and Sediment Control (TESC) Report
and
Stormwater Pollution Prevention Plan
For Construction Activities

Project Type: Small Site Commercial

Project Name: Bright Stars Daycare

Project Address/Site Location: 355 E. Sunset Way, Issaquah, WA 98027

Permit Number:

Owner/Developer: Tharaka & Deepthi Devadithya

Contractor: Encompass Engineering & Surveying

Property Area (sq ft): 13,200 SF

Area to be Cleared (sq ft): 13,825 SF

Estimated Total Fill (cubic yards): 300

Estimated Total Excavation (cubic yards): 30

Existing Impervious Area (sq ft): 2,199 SF

New Impervious Area (sq ft): 6,563 SF

Replaced Impervious Area (sq ft): 2,199 SF

Prepared by: Gabe Garner

Date Prepared: 12/16/2021

1. INTRODUCTION

This Temporary Erosion and Sediment Control Report and Stormwater Pollution Prevention Plan for the City of Issaquah (TESC Report) has been prepared as part of the City of Issaquah permit requirements for the ____Bright Stars Daycare_____ construction project.

The Contractor is required to comply with the terms of this TESC Report and any TESC measures shown on the approved plans. The Contractor shall designate a TESC Supervisor who shall be responsible for the performance, maintenance, and review of TESC measures as described in this TESC Report and the approved plans.

After the permit is issued, a TESC Preconstruction Meeting will be held onsite to discuss the TESC plans for the site. Any changes needed to adapt the plan to actual site conditions can be addressed at that meeting. For example, proposed silt fence locations are reviewed to ensure that they are appropriate for the site.

Overall TESC requirements for the City of Issaquah are described in the 2017 City of Issaquah Stormwater Design Manual Addendum to the 2014 Stormwater Management Manual for Western Washington. This document is available at http://issaquahwa.gov/DocumentCenter/View/1049

For more information on TESC requirements specific to single family residential construction, see Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP) in the 2014 Stormwater Management Manual for Western Washington. This document is available at http://www.ecy.wa.gov/programs/wq/stormwater/manual/2014SWMMWWinteractive/Content/Resources/DocsForDownload/2014SWMMWW.pdf

2. SITE DESCRIPTION

Describe the existing conditions, topography, drainage facilities, soils, critical areas, etc, as appropriate. This is intended to be a brief overview of the site.

The project is located in the City of Issaquah on a 13,200 SF (0.30 AC) parcel that is zoned as Multifamily-High (MF-H). The site currently contains a 1,199 SF (roof area) single-family residence, a 97 SF (roof area) shed, and 903 SF of uncovered walkways. The site is bordered to the north by E. Sunset Way, to the west by a small apartment building, and to the south and east by single-family residential lots. The site does not have any critical areas associated with it; however, the site is located within a Category 1 Critical Aquifer Recharge Area (CARA). The soils on site have been classified by the United States Geological Survey (USGS) Web Soils Survey as Everett very gravelly sandy loam. The site is generally flat with 2-3% slopes in the southwest direction.

3. PROPOSED CONSTRUCTION ACTIVITIES AND SCHEDULE

a. Describe the proposed construction activities and an approximate schedule for the project. Include the existing and proposed storm drainage.

The project proposes the construction of a new daycare within the 13,200 SF (1.73 AC) parcel, with parking lot access off the private alley located south of the site. Proposed on-site hard surfaces will include 1,914 SF of impervious rooftop, 370 SF of vegetated rooftop, 3,959 SF of uncovered asphalt parking, and 793 SF of uncovered concrete walkways/pads. An additional 172 SF of new asphalt pavement and 77 SF of replaced concrete sidewalk is located off-site in the public right-of-way (ROW). Proposed hard surfaces total 7,285 SF. Stormwater runoff from all new impervious surfaces will be collected via on-site area drains and catch basins and conveyed to underground infiltration beds located underneath the grass play area in the southwestern portion of the site. Enhanced water quality treatment will be provided for proposed pollution generating impervious surfaces (PGIS) prior to infiltrating stormwater runoff on-site.

b. What is the approximate square footage of the total site disturbance, including clearing and grading for buildings, driveways, drain fields, etc.?

Approximately 13,825 SF. This includes both on-site and off-site clearing.

4. CONSTRUCTION TESC BEST MANAGEMENT PRACTICES (BMPS)

Describe below how each of the following will be addressed for the project. See Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP), for more information.

The Monitoring Points and BMPs are to be shown on the project site plan as much as possible. If for some reason this is a problem, it is acceptable to provide the information on a separate sketch.

a. Monitoring Points
Identify Monitoring Points on the site plan for all locations where runoff normally discharges from the project site. This includes possible discharges to roadside ditches, drainage swales, storm drains, etc. The City will measure the turbidity of the discharge at the Monitoring Points to verify compliance with the permit.

For project sites where designating a monitoring point is not feasible (for example, flat sites or sites where runoff sheet flows across the property), the monitoring locations will be at the discretion of the City of Issaquah.

Monitoring Points should be located near the southwestern corner of the site, as this is where runoff would leave the site in the event of a 100 year storm.

b. Mark Clearing Limits/Minimize Clearing
Show the clearing and grading limits for the project. The purpose of the clearing and grading limits is to define the project boundaries and to prevent disturbance of areas not designated for clearing and grading (e.g. critical areas and buffers). Silt fence is often used to define clearing and grading limits.

The clearing limits are shown on the TESC plans surrounding all proposed construction activity.

c. c) Minimize Sediment Tracked Offsite
Show the construction entrance and any related parking or staging areas.

A stabilized construction entrance is shown for the project off of the alley. If sediment is tracked off site, the affected roadways are to be cleaned thoroughly at the end of each day.

d. Control Sediment

Describe how and where perimeter protection (e.g. silt fence) to filter sediment from sheet flow will be provided downhill from disturbed areas. Perimeter protection shall be provided to protect all critical areas and buffers. Provide storm drain inlet protection for nearby storm drains.

Silt fence will be utilized to control sediment and protect adjacent properties.

e. Stabilize Exposed Soils/Stockpiles

Describe how and what cover measures (straw or other mulch, plastic, erosion control blankets, etc.) will be used to protect disturbed areas and any stockpiled material during both dry weather and wet weather.

Stabilize exposed and unworked soils. Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:

•During the dry season (May 1 – September 30): 7 days

•During the wet season (October 1 – April 30): 2 days

Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast. Stockpiled soils are to be covered with plastic. All disturbed areas shall be stabilized with landscaping or some other method prior to final construction approval.

f. Protect Slopes

Describe how slopes on site will be protected to minimize erosion.

Slopes will be protected by designing and constructing cut-and-fill slopes in a manner to minimize erosion.

g. Control Runoff

Describe how stormwater runoff will be managed on the site to keep sediment-laden water from leaving the site. Typical measures include temporary ditches and ponds. Also, if appropriate, describe the BMPs to be used to keep any uphill surface water and stormwater runoff away from the project site.

Straw Wattles will be used to control flow rates during construction.

h. Control Dewatering

Describe the BMPs to be used to manage turbid water resulting from any dewatering of foundations, excavations, etc. Pumping any water offsite is not allowed without prior approval from the City of Issaquah.

Dewatering is not anticipated at this site.

i. Protecting Low Impact Development BMPs

Describe how you will protect all Bioretention and Rain Garden BMPs from sedimentation and compaction during the construction process.

No bioretention or rain garden BMPs are proposed for this project.

j. Final Stabilization
All disturbed areas shall be stabilized with landscaping or some other method prior to final construction approval.

5. WET SEASON REQUIREMENTS

If construction is scheduled during the wet season (October 1st to April 30), describe any additional BMPs that may be used to meet wet season requirements. If the wet season BMPs can be addressed in these plans and TESC Report, an updated plan and TESC Report will not be required for construction during the wet season.

6. POLLUTION PREVENTION AND SPILL PREVENTION BMPS

Pollution control measures shall be followed to ensure that no liquid products or contaminated water enters the storm drainage system or otherwise leaves the project site. Describe the BMPs to be used for the following activities:

Note: If the site is located in the Critical Aquifer Recharge Area (CARA) Class 1 or 2, specific pollution prevention BMPs are required (i.e. secondary containment and spill containment supplies).

a. Storage and Handling of Hazardous Materials
Hazardous materials include petroleum products such as oil, fuel, cold mix, paint, solvents, curing compounds, etc. Liquid products stored outside that may contaminate stormwater runoff if spilled shall be stored under cover and in containment. Spill cleanup materials shall be available at the site.

b. Concrete Work and Paving Operations
Describe the BMPs to be used to ensure materials used during concrete foundation work and paving operations do not enter storm drainage systems, surface waters, or wetlands. Concrete washout must be managed properly.

7. CONTACTS

Provide contact information (name and phone numbers) for the following:

Owner/developer: Tharaka & Deepthi Devadithya

Contractor: TBD

TESC Supervisor (person responsible for providing TESC for the site): TBD

Appendix D

WWHM Results

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	WWHM_Flow Control
Site Name:	
Site Address:	
City:	
Report Date:	12/15/2021
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.333
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.314
Pervious Total	0.314
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.314

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	0.155
Pervious Total	0.155

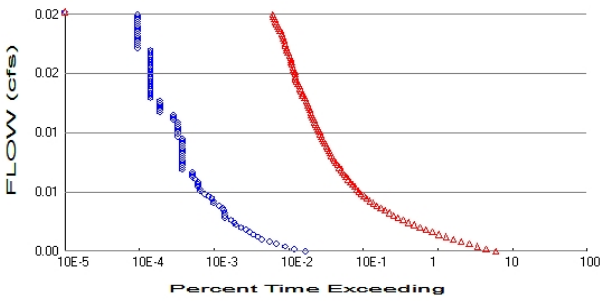
Impervious Land Use	acre
SIDEWALKS FLAT	0.02
Impervious Total	0.02
Basin Total	0.175

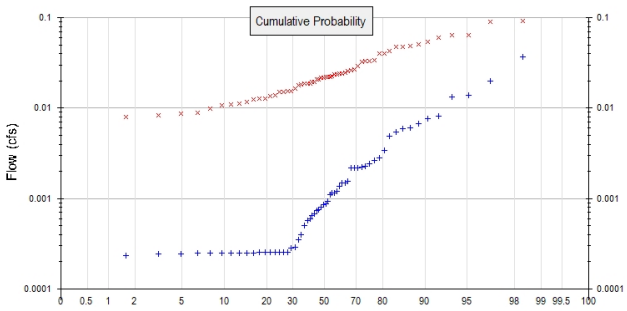
Element Flows To:

Surface	Interflow	Groundwater

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.314
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.155
Total Impervious Area: 0.02

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000913
5 year	0.003059
10 year	0.00615
25 year	0.01364
50 year	0.023486
100 year	0.039054

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.021683
5 year	0.036845
10 year	0.049471
25 year	0.06866
50 year	0.085493
100 year	0.104664

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.001	0.041
1950	0.013	0.051
1951	0.002	0.029
1952	0.001	0.011
1953	0.000	0.008
1954	0.002	0.022
1955	0.000	0.021
1956	0.005	0.022
1957	0.001	0.026
1958	0.001	0.013

1959	0.001	0.014
1960	0.003	0.022
1961	0.001	0.024
1962	0.000	0.008
1963	0.001	0.024
1964	0.003	0.022
1965	0.001	0.034
1966	0.000	0.014
1967	0.008	0.048
1968	0.002	0.024
1969	0.001	0.019
1970	0.000	0.019
1971	0.001	0.022
1972	0.008	0.048
1973	0.000	0.010
1974	0.001	0.024
1975	0.002	0.027
1976	0.002	0.018
1977	0.000	0.011
1978	0.000	0.012
1979	0.000	0.015
1980	0.000	0.043
1981	0.000	0.016
1982	0.001	0.048
1983	0.000	0.015
1984	0.001	0.015
1985	0.000	0.011
1986	0.000	0.021
1987	0.003	0.020
1988	0.000	0.009
1989	0.000	0.013
1990	0.020	0.093
1991	0.007	0.064
1992	0.000	0.015
1993	0.000	0.009
1994	0.000	0.008
1995	0.005	0.018
1996	0.014	0.040
1997	0.002	0.032
1998	0.001	0.019
1999	0.006	0.064
2000	0.000	0.026
2001	0.000	0.012
2002	0.002	0.020
2003	0.001	0.033
2004	0.001	0.054
2005	0.000	0.023
2006	0.002	0.025
2007	0.037	0.090
2008	0.006	0.060
2009	0.000	0.033

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0373	0.0926
2	0.0200	0.0903
3	0.0138	0.0641

4	0.0132	0.0637
5	0.0082	0.0604
6	0.0077	0.0543
7	0.0067	0.0506
8	0.0061	0.0484
9	0.0059	0.0481
10	0.0055	0.0477
11	0.0049	0.0427
12	0.0034	0.0406
13	0.0028	0.0401
14	0.0026	0.0337
15	0.0024	0.0334
16	0.0023	0.0331
17	0.0022	0.0323
18	0.0022	0.0293
19	0.0022	0.0266
20	0.0022	0.0264
21	0.0016	0.0256
22	0.0015	0.0249
23	0.0015	0.0243
24	0.0014	0.0239
25	0.0012	0.0238
26	0.0012	0.0237
27	0.0011	0.0227
28	0.0011	0.0222
29	0.0009	0.0220
30	0.0009	0.0220
31	0.0008	0.0218
32	0.0008	0.0217
33	0.0008	0.0208
34	0.0007	0.0207
35	0.0007	0.0196
36	0.0006	0.0195
37	0.0006	0.0188
38	0.0006	0.0187
39	0.0005	0.0186
40	0.0004	0.0184
41	0.0004	0.0179
42	0.0003	0.0163
43	0.0003	0.0155
44	0.0003	0.0154
45	0.0003	0.0152
46	0.0003	0.0152
47	0.0003	0.0139
48	0.0003	0.0136
49	0.0003	0.0127
50	0.0003	0.0127
51	0.0003	0.0124
52	0.0003	0.0118
53	0.0003	0.0113
54	0.0003	0.0110
55	0.0003	0.0107
56	0.0002	0.0100
57	0.0002	0.0088
58	0.0002	0.0086
59	0.0002	0.0083
60	0.0002	0.0080
61	0.0002	0.0079

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Local (360)943-0304

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WWHM2012

PROJECT REPORT

General Model Information

Project Name:	WWHM_Water Quality
Site Name:	
Site Address:	
City:	
Report Date:	12/14/2021
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.333
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.0948
Pervious Total	0.0948
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.0948

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

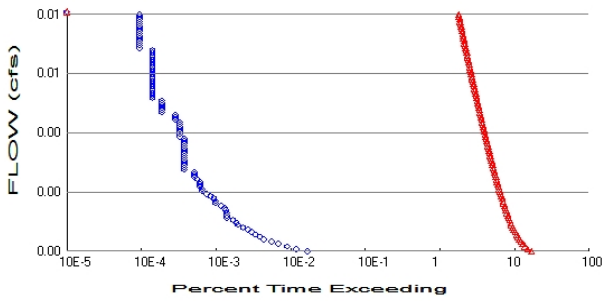
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
DRIVEWAYS FLAT	0.0948
Impervious Total	0.0948
Basin Total	0.0948

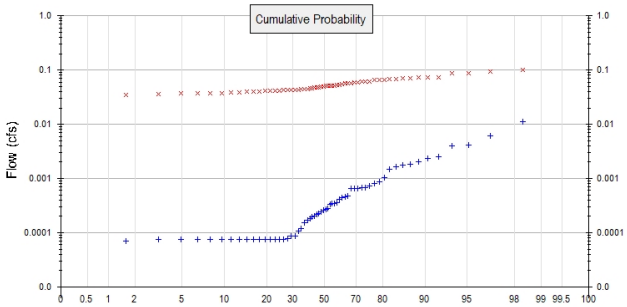
Element Flows To:

Surface	Interflow	Groundwater

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.0948
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0
Total Impervious Area: 0.0948

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000276
5 year	0.000924
10 year	0.001857
25 year	0.004118
50 year	0.007091
100 year	0.011791

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.050427
5 year	0.063586
10 year	0.072514
25 year	0.084084
50 year	0.092931
100 year	0.101987

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.000	0.065
1950	0.004	0.070
1951	0.001	0.040
1952	0.000	0.035
1953	0.000	0.039
1954	0.001	0.041
1955	0.000	0.047
1956	0.002	0.044
1957	0.000	0.051
1958	0.000	0.042

1959	0.000	0.044
1960	0.001	0.042
1961	0.000	0.043
1962	0.000	0.038
1963	0.000	0.043
1964	0.001	0.043
1965	0.000	0.052
1966	0.000	0.035
1967	0.002	0.061
1968	0.001	0.072
1969	0.000	0.048
1970	0.000	0.047
1971	0.000	0.056
1972	0.002	0.056
1973	0.000	0.036
1974	0.000	0.052
1975	0.000	0.058
1976	0.001	0.040
1977	0.000	0.043
1978	0.000	0.056
1979	0.000	0.073
1980	0.000	0.065
1981	0.000	0.051
1982	0.000	0.073
1983	0.000	0.060
1984	0.000	0.037
1985	0.000	0.051
1986	0.000	0.045
1987	0.001	0.069
1988	0.000	0.042
1989	0.000	0.060
1990	0.006	0.087
1991	0.002	0.071
1992	0.000	0.037
1993	0.000	0.040
1994	0.000	0.037
1995	0.001	0.046
1996	0.004	0.051
1997	0.001	0.047
1998	0.000	0.049
1999	0.002	0.100
2000	0.000	0.049
2001	0.000	0.056
2002	0.000	0.062
2003	0.000	0.052
2004	0.000	0.094
2005	0.000	0.041
2006	0.001	0.037
2007	0.011	0.088
2008	0.002	0.069
2009	0.000	0.066

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0113	0.1004
2	0.0060	0.0944
3	0.0042	0.0885

4	0.0040	0.0870
5	0.0025	0.0730
6	0.0023	0.0727
7	0.0020	0.0720
8	0.0018	0.0711
9	0.0018	0.0698
10	0.0016	0.0690
11	0.0015	0.0688
12	0.0010	0.0662
13	0.0009	0.0655
14	0.0008	0.0650
15	0.0007	0.0616
16	0.0007	0.0607
17	0.0007	0.0602
18	0.0007	0.0596
19	0.0007	0.0581
20	0.0007	0.0564
21	0.0005	0.0562
22	0.0005	0.0560
23	0.0004	0.0560
24	0.0004	0.0523
25	0.0004	0.0522
26	0.0004	0.0520
27	0.0003	0.0514
28	0.0003	0.0510
29	0.0003	0.0507
30	0.0003	0.0506
31	0.0003	0.0489
32	0.0002	0.0487
33	0.0002	0.0476
34	0.0002	0.0475
35	0.0002	0.0471
36	0.0002	0.0468
37	0.0002	0.0461
38	0.0002	0.0445
39	0.0002	0.0444
40	0.0001	0.0439
41	0.0001	0.0433
42	0.0001	0.0429
43	0.0001	0.0428
44	0.0001	0.0425
45	0.0001	0.0422
46	0.0001	0.0419
47	0.0001	0.0418
48	0.0001	0.0413
49	0.0001	0.0407
50	0.0001	0.0401
51	0.0001	0.0399
52	0.0001	0.0397
53	0.0001	0.0391
54	0.0001	0.0380
55	0.0001	0.0374
56	0.0001	0.0372
57	0.0001	0.0369
58	0.0001	0.0369
59	0.0001	0.0361
60	0.0001	0.0348
61	0.0001	0.0346

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.0152 acre-feet
On-line facility target flow:	0.0208 cfs.
Adjusted for 15 min:	0.0208 cfs.
Off-line facility target flow:	0.0117 cfs.
Adjusted for 15 min:	0.0117 cfs.

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